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THOUGHT LEADERSHIP

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Gas Transmission Pipelines

Amended Regulations for Seismicity and Outside Forces

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Between 1999 and 2018, gas pipeline incidents in the United States contributed to 291 fatalities and 1,267 injuries at a cost of over $9 billion.[1] The vulnerability of our aging gas pipeline infrastructure is increasing over time. In the United States, two-thirds of natural gas transmission lines were installed before 1970,[2] and over 80% of gas pipelines and nearly 75% of liquid pipelines were installed before 2000.[3] The relative age of these pipelines and the recent potential liability of utility companies to devastating damage (e.g., wildfires in California) underscore the importance of a systematic and comprehensive approach to managing the safety and integrity of pipeline systems.

On October 1, 2019, the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) issued amendments to the federal pipeline safety regulations for gas transmission pipelines and hazardous liquid pipelines (a.k.a. "Mega Rule"). These amendments strengthen the requirements for seismic and geotechnical evaluation of pipelines and other infrastructure to ensure that these assets can effectively and efficiently perform their required functions throughout their lifecycle. Utility operators will need to incorporate these changes into their integrity management programs using a robust framework for identifying and addressing threats to pipelines from weather and outside forces and incorporate the seismic and geotechnical amendments contained in the PHMSA's new Mega Rule.

Amended Regulations for Outside Force Damage

While the Code of Federal Regulations (CFR) already implicitly required pipeline operators to address seismicity and other geotechnical hazards,[4] PHMSA's amended Mega Rule now explicitly requires operators to identify and evaluate all potential threats including "consideration of seismicity, geology, and soil stability of the area."[5] In this way, the Mega Rule requires operators to "analyze seismicity and related geotechnical hazards, such as geology and soil stability" as part of their efforts to identify and mitigate threats to their pipelines. The amended Mega Rule also requires that operators take measures to prevent damage from outside forces (new amended text in bold): "If an operator determines that outside force (e.g., earth movement, loading, longitudinal, or lateral forces, seismicity of the area, floods, unstable suspension bridge) is a threat to the integrity of a covered segment, the operator must take measures to minimize the consequences to the covered segment from outside force damage."[6]

As the July 1, 2020 effective date for this amendment approaches, it will be important for utility operators to consider how best to incorporate the seismicity, geology, and soil stability of the area into their integrity management program.

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[1] https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-incident-20-year-trends
[2] Integrity Characteristics of Vintage Pipelines," Prepared by Battelle Memorial Institute for the INGAA Foundation, 2005
[3] PHMSA Annual Gas Transmission and Gathering Data 2018; PHMSA Annual Hazardous Liquid Data 2017
[4] 49 CFR § 192.917 implicitly required pipeline operators to address seismicity by referencing ASME B31.8S
[5] PHMSA's Mega Rule amendments to 49 CFR § 192.917
[6] 49 CFR § 192.935

Gas Transmission Pipelines

A Framework for Reducing Risk Exposure

Exponent has partnered with multiple utility operators to develop prioritized prevention, detection, and mitigation plans to address threats to pipelines from weather and outside forces. Our team begins by identifying potential threats to pipelines and developing a relative quantitative estimate of the hazards based on historical and readily available data, as well as non-intrusive studies. We then take a phased approach to quantify geotechnical and seismic hazards in a systematic and consistent manner across the entire pipeline system.

Exponent's approach includes 1) identifying input parameters; 2) establishing factors that provide a measurable indication of the hazard; 3) evaluating data quality or confidence parameters; 4) calculating a hazard measure and uncertainty range in the hazard measure; and 5) assigning a hazard category (typically, High, Moderate, Low, or Insufficient Data) to each pipeline segment.

Utility operators can then use the information gathered from this process to inform the allocation of resources across programs. Effective resource allocation can in turn help utilities prioritize work, limit liability, improve compliance, enhance accident prevention, and increase reliability.

Exponent's Expertise

Exponent's multi-disciplinary team of engineers and scientists can help utility operators develop and execute improved integrity management plans that align with amended regulations for outside force damage and help reduce risk exposure.

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